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Renewable Resources Forest Health Management

Rocky Mountain Region

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FOREST INSECT AND DISEASE CONDITIONS

IN THE

ROCKY MOUNTAIN REGION

1995

By

The Forest Health Management Group

Susan J. Johnson, Biologist, Ed.

July 1996

USDA Forest Service
Rocky Mountain Region
Renewable Resources, Forest Health Management
P.O. Box 25127
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ACKNOWLEDGMENTS

The Forest Health Management (FHM) Staff of the Renewable Resources Unit extends appreciation to all cooperators who contributed to this report.

Information on specific pest problems may be obtained from the Regional Office (303/275-5061), Lakewood Service Center (303/236-9541), Gunnison Service Center (970/641-0471), or Rapid City Service Center (605/394-1960), as well as from the following State Foresters:

COLORADO

Jim Hubbard, State Forester
Colorado State Forest Service
Forestry Building
Colorado State University
Fort Collins, Colorado 80523
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KANSAS

Raymond G. Aslin, State Forester
Kansas State Division of Forestry
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Manhattan, Kansas 66502
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NEBRASKA

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Department of Forestry, Fisheries, and Wildlife
Institute of Agriculture and Natural Resources
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East Campus, University of Nebraska
Lincoln, Nebraska 68583-0814
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SOUTH DAKOTA

Ray Sowers, State Forester
Division of Resource Conservation and Forestry
Foss Building, 523 E. Capitol Avenue
Pierre, South Dakota 57501
Phone : 605/773-4260 FAX : 605/773-5926

WYOMING

Mike Gagen, State Forester
Wyoming State Forestry Division
1100 West 22nd Street
Cheyenne, Wyoming 82002
Phone : 307/777-7586 FAX : 307/637-8726

Cover: Picture of the Buffalo Creek Fire with Top-Of-The-World Campground in the background

Photographer: Bill Schaupp

MAILING LIST UPDATE

Annual Report 1995

Annually, we update our mailing list. If you have had an address change or would like to receive publications other than what you currently receive, please note the change and return this sheet to the P.O. Box Mailing Address listed below.

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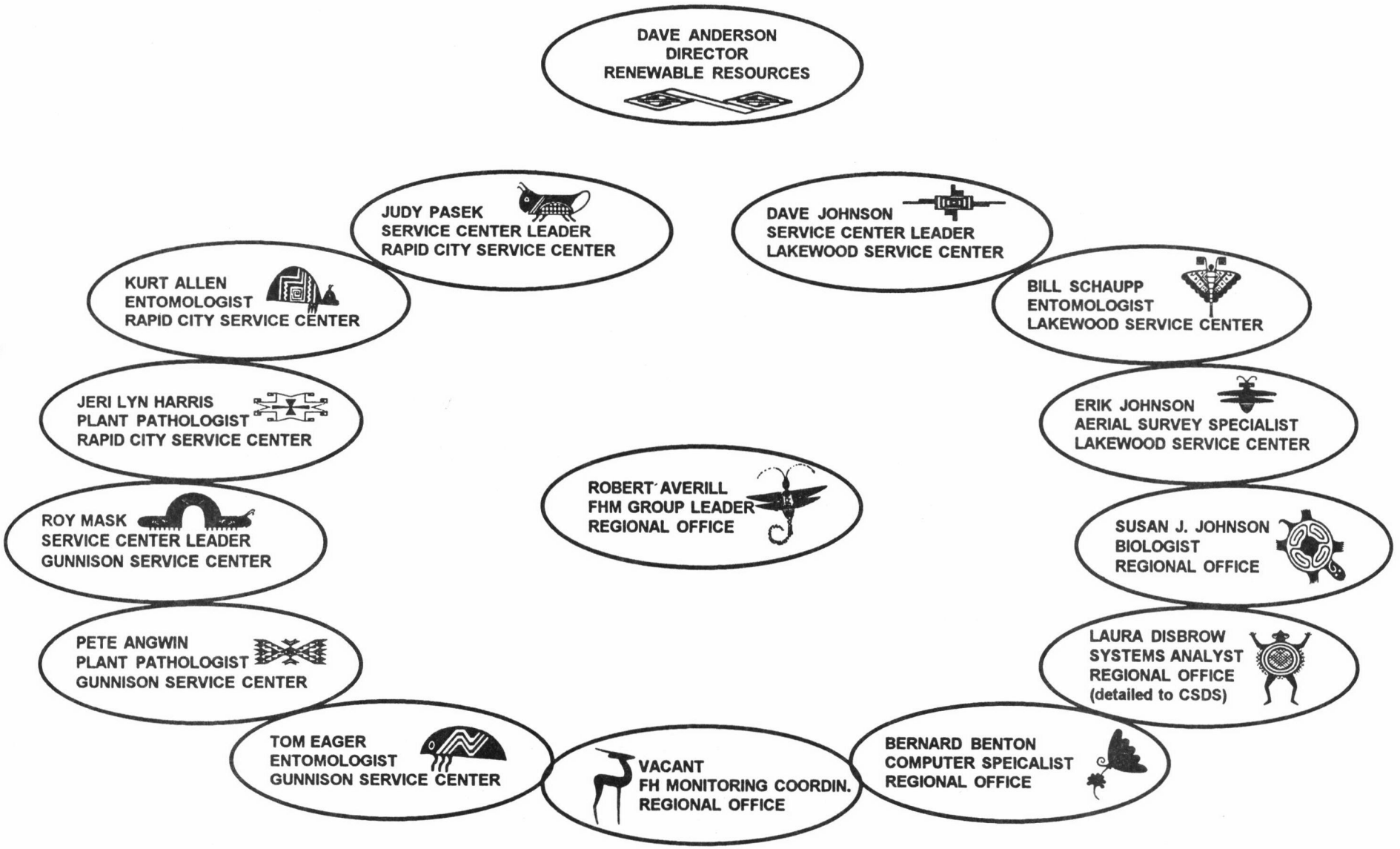
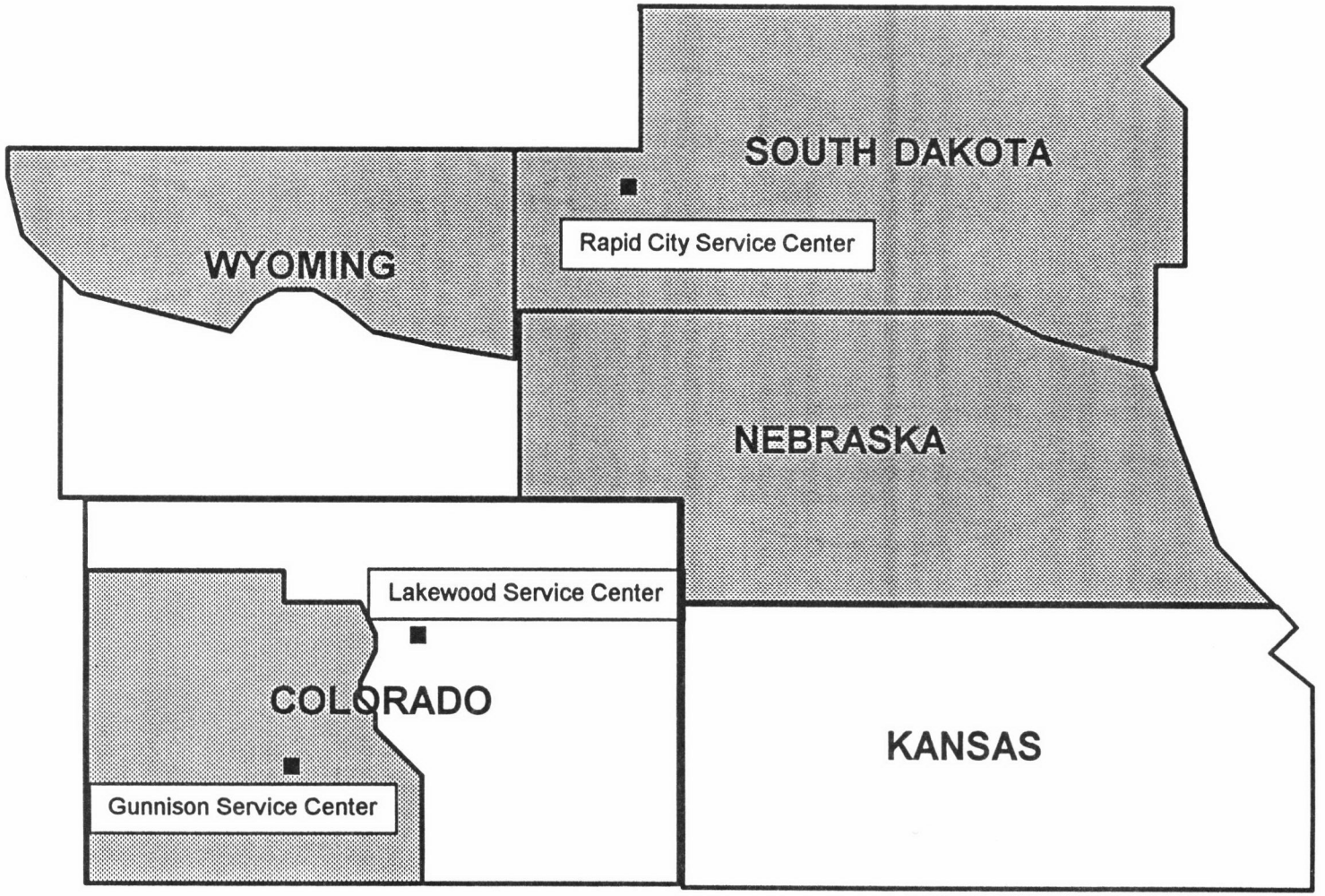
INTRODUCTION

Forest Health Management (FHM) is responsible for the detection, evaluation, and suppression of insects and diseases on forested Federal lands. FHM also administers financial and technical assistance programs with the State Foresters of Colorado, Kansas, Nebraska, South Dakota, and Wyoming. In addition, the management of gypsy moth is a shared responsibility with the Animal and Plant Health Inspection Service (APHIS). APHIS also has the responsibility for range pest management programs on Federal lands. Close coordination and cooperation of the Federal and State agencies responsible for Forest Health management are necessary for effective program execution.

FOREST HEALTH MANAGEMENT ORGANIZATION-1995
Rocky Mountain Region



ROCKY MOUNTAIN REGION
Forest Health Management Zones



FOREST HEALTH MANAGEMENT SERVICE CENTERS

Three Service Centers serve the Rocky Mountain Region. These were established to provide timely and effective pest management services to their customers. Questions concerning Center operations and requests for service can be directed to the Forest Health Management (FHM) Group Leader in the Regional Office or the respective Service Center Leaders.

The **Lakewood Service Center (LSC)**, 303/236-9451, 303/236-9542 FAX, in Building 20, on the Denver Federal Center provides assistance to Kansas, eastern and northwestern Colorado, and southern Wyoming. This includes the following National Forests and cooperators in adjacent areas:

Pike and San Isabel (except Leadville, Salida, and San Carlos Ranger Districts)
Arapaho and Roosevelt
Routt
Medicine Bow
White River (Dillon Ranger District only)

Dave Johnson, Supervisory Plant Pathologist, is the Service Center Leader. Willis (Bill) Schaupp is the LSC Entomologist and Erik Johnson serves Region 2 as the Aerial Survey Specialist.

The **Gunnison Service Center (GSC)**, 970/641-0471, 970/641-1928 FAX, is located at 216 North Colorado, Gunnison, Colorado, 81230. It provides assistance to the following National Forests and cooperators west of the Continental Divide in Colorado:

Rio Grande
Pike and San Isabel (Leadville, Salida, and San Carlos Ranger Districts)
San Juan
Grand Mesa, Uncompahgre, and Gunnison
White River (except the Dillon Ranger District)

Roy Mask is the Supervisory Entomologist and Service Center Leader. Pete Angwin is the Plant Pathologist and Tom Eager is the Center's Entomologist.

The **Rapid City Service Center (RSCS)**, 605/394-1960, 605/394-6627 FAX, is co-located with the Rocky Mountain Forest and Range Experiment Station at the Forestry Sciences Lab, South Dakota School of Mines and Technology, 501 E. St. Joe, Rapid City, South Dakota, 57701. The Service Center provides assistance to the following National Forests and cooperators east of the Continental Divide in northern Wyoming, and in South Dakota and Nebraska within Region 2:

Black Hills
Bighorn
Shoshone
Nebraska

Judy Pasek is Supervisory Entomologist and Service Center Leader. Jeri Lyn Harris is the Plant Pathologist and Kurt Allen recently arrived to serve as the Center's Entomologist.

The Forest Health Management (FHM) staff in the Regional Office, 303/275-5061, 303/275-5075 FAX, located at 740 Simms Street, Golden, Colorado, 80401, provides assistance to the three Service Centers. Robert Averill is the Group Leader; Laura Disbrow is the Systems Analyst; Susan Johnson, Biologist, handles special projects such as Cinara, reports, and is Acting Pesticide Specialist; Bernard Benton, Computer Specialist, provides assistance with data entry and testing. Currently, the Forest Health Monitoring Coordinator position for the Rocky Mountain Region is vacant and is not expected to be filled in the immediate future.

FOREST HEALTH MANAGEMENT SPECIAL REGIONAL PROJECTS

PROJECT TITLE:

Piney River Analysis -
White River National Forest

INVESTIGATORS: Pete Angwin, Tom Eager, Dave Johnson, Forest Health Management (FHM); Wendy Bailey, Dave VanNorman, White River NF; Eric Smith, Forest Health Technology Enterprise Team (FHTET).

COOPERATORS: Matt Thompson, FHTET.

YEARS: Began 1993; End 1995.

PROJECT DESCRIPTION: At the request of the White River National Forest and the Holy Cross Ranger District, the forest health of the Piney River / Red Sandstone Area was examined. Because of the history of mountain pine beetle and lodgepole pine dwarf mistletoe activity in the lodgepole pine cover type (15,184 acres), that forest component was chosen for detailed evaluation. However, attention was also given to the impacts of spruce beetle in the spruce/fir cover type.

Analysis of existing stand exam data confirmed that the greatest threat to the lodgepole pine stands in the area was from mountain pine beetle, lodgepole pine dwarf mistletoe, and Armillaria root disease. Once these major impacts were identified, a systematic survey was performed in which 20% of the lodgepole pine stands in the analysis area were examined. Stands were stratified and chosen for additional survey according to mountain pine beetle risk (high, medium, low), dwarf mistletoe incidence (high, medium, low, none), and geographic location within the analysis area (north, south, and east). Armillaria root disease was found in over half of the surveyed stands, and 19% of the acres were in moderate or high infestation classes. During the 1994 field season, stand exams were repeated in these stands, but a number of additional data items were added to address information gaps with regards to the three major pests of interest.

A Biological Evaluation Report detailing the findings and management recommendations of the Piney River / Red Sandstone Analysis Area is in the final stages of preparation.

PROJECT TITLE:

Pest Trend Impact Plots In The West -
Rocky Mountain Region

INVESTIGATORS: Pete Angwin, Jeri Lyn Harris, Dave Johnson, and Bernard Benton, FHM.

COOPERATORS: Bov Eav, Renee Platz, Julie Williams-Cipriani, Judy Adams, FHTET; Jim Friedly, BIA Southern Ute Agency; Elizabeth Stiller, Randy Rick, Jim Allen, and Steve Picsche, Black Hills NF; Sam Schroeder, White River NF; Gary Roper, Mike Morrison and Mike Westfahl, Routt NF; Paul Langowski and Steve Johnson, Roosevelt NF; Jon Morrissey, Grand Mesa / Uncompahgre / Gunnison NF's; Phil Kemp and Bob Vermillion, San Juan NF.

YEARS: Began 1990; End undetermined.

PROJECT DESCRIPTION: For the past 5 years, Region 2 has been actively involved with the westwide technology development project, "Pest Trend Impact Plots In The West." The objective of the project is to establish a series of permanent plots to provide data for the validation and calibration of various insect and disease computer simulation models. To date, most of the work has concentrated on the installation of plots to monitor the spread of Armillaria, annosus, and black stain root disease.

In addition to the installation of the permanent plots, Region 2 FHM participated in the beta-testing of the Pest Trend Impact Plot System (PTIPS) data entry programs. In the spring of 1994, the PTIPS database was installed on the Data General System at the Rocky Mountain Regional Office. Recommendations from the beta-test are currently being used to fine tune the database system.

In 1995, remeasurement of the permanent plots that were installed in 1991 and 1993 occurred. Additionally, personnel from the Rapid City Service Center will remonument and remeasure Comandra blister rust plots that were installed in the 1980's.

FOREST HEALTH MANAGEMENT SPECIAL REGIONAL PROJECTS

PROJECT TITLE:

Survey of biological species of Armillaria and Heterobasidion in Region 2.

INVESTIGATORS: Pete Angwin, Jeri Lyn Harris, Dave Johnson, and Yun Wu, FHM.

COOPERATORS: Terry Shaw, Dan Omdal, and John Lundquist, Rocky Mountain Forest and Range Experiment Station; Geral McDonald, Intermountain Research Station; Alice Ratcliffe, Pacific Southwest Forest and Range Experiment Station; various Forest and Ranger District personnel.

YEARS: Began 1993; End undetermined.

PROJECT DESCRIPTION: The objective is to determine the biological species of Armillaria and Heterobasidion root disease in various hosts and ecosystem in the Rocky Mountain Region. This information will then be used to develop better root disease management strategies for our customers. Starting in 1993, diseased wood samples containing Armillaria and Heterobasidion, collected throughout the region, were sent to the diagnostic lab at the FHA Lakewood Service Center. The pathogens were isolated and identified by pairing unknown isolates with known tester strains in culture. Although identification of the isolates is not yet complete, all isolates that have been paired to date have been *A. ostoyae*. The isolates have been catalogued and will be kept in cold storage as part of the Region's new fungal reference collection. A technical report detailing the survey results is currently in preparation.

PROJECT TITLE:

Ski Area Vegetation Management

INVESTIGATORS: Pete Angwin, Tom Eager, Dave Johnson, FHM.

COOPERATORS: Jon Morrissey, Grand Mesa / Uncompahgre / Gunnison NF's; Jim Stark, White River NF; Dick Myhre and Barry Russell, FHTET.

Ski Area Vegetation Management...

YEARS: Began 1993; End undetermined.

PROJECT DESCRIPTION: For the past 6 years, forest health in developed recreation areas has been a major focus of attention of FHM in the Rocky Mountain Region. Most forest health management efforts have concentrated on vegetation management in campgrounds, picnic areas, and along scenic byways. However, at the request of the Aspen and Taylor River / Cebolla Ranger District's, the Gunnison Service Center became involved in the development of vegetation management plans for Aspen Mountain and Crested Butte Mountain Resort ski areas. Armillaria root disease and western balsam bark beetle (*Dryocoetes confusus*) were identified as major causes of spruce/fir mortality at both ski areas. Survey results and management recommendations have been incorporated into two Biological Evaluations, as well as, into the ski area vegetation management plans. In July 1995, walk-through assessments were made at Aspen Highlands, Buttermilk and Snowmass ski areas. Studies on the flight periodicity of western balsam bark beetle are continuing at Aspen Mountain ski area for 1996.

PROJECT TITLE:

GIS - based Landscape Scale Root Disease Hazard Rating System.

INVESTIGATORS: Jeri Lyn Harris, Judy Pasek, and Dave Johnson, FHM.

COOPERATORS: William Jacobi, Dept. of Plant Pathology and Weed Science, CSU; Robin Reich, Dept. of Forestry, CSU; Melanie Kallas, Graduate Student, Dept. of Forestry, CSU.

YEARS: Began 1995; End 1997.

PROJECT DESCRIPTION: Existing data on Armillaria root disease occurrence and new field data, will be coupled with NRCS soil classification, stand inventory, site disturbance, habitat type, and meteorological data in a GIS

FOREST HEALTH MANAGEMENT SPECIAL REGIONAL PROJECTS

PROJECT TITLE:

GIS - based Landscape Scale Root Disease Hazard Rating System...

database. Utilizing spatial statistical analysis, an Armillaria root disease hazard rating system will be developed for the Black Hill National Forest.

PROJECT TITLE:

Site and Stand Factors Associated with the Occurrence of Douglas-fir beetle in Douglas-fir

INVESTIGATORS: Bill Schaupp, FHM; Jose Negron, Rocky Mountain Forest and Range Experiment Station; Ken Gibson, FHM-Region 1; Ralph Thier, Steve Munson, and others, FHM-Region 4.

COOPERATORS: Biometrics Group - Rocky Mountain Forest and Range Experiment Station.

YEARS: Began 1992; End 1996.

PROJECT DESCRIPTION: The objective is to evaluate characteristics of DFB infestations in Douglas-fir in order to develop an estimate of loss model. This model will be available to classify stands according to the relative level of expected mortality from future DFB epidemics. This project will provide a planning tool that can be used to prioritize proactive hazard mitigation efforts and predict future DFB epidemics. Douglas-fir stands recently infested by DFB and uninfested stands were sampled and data collected on site, stand, and tree characteristics using standard USFS inventory procedures. More than 700 variable radius plots were measured in Colorado, Idaho, Utah, Montana, and Wyoming. Analysis is well underway and results are very encouraging. A product is anticipated by Fall 1996, accompanied by publication of project results in the scientific literature.

PROJECT TITLE:

Forest Health Monitoring - Off-Plot Monitoring

INVESTIGATORS: Forest Health Managment-Region 2; Intermountain Research Station - FIA; Colorado State Forest Service.

YEARS: Began 1991; On-going.

PROJECT DESCRIPTION: Forest Health Monitoring is a national program authorized by the Forest Ecosystems and Atmospheric Pollution Research Act of 1988, and the Food, Agriculture, Conservation, and Trade Act of 1990 (Farm Bill) amendments to the Cooperative Forestry Assistance Act of 1978 (P.L. 95-313). The Forest Health Program evolved in response to the public's concern for the "health and productivity of forests in the United States." In order to address the public's concern and the effects of various stressors on the forest ecosystem, a long-term monitoring program was developed. Currently, the State of Colorado participates in the national program; additional Rocky Mountain states will join the program in the near future.

The Forest Health Monitoring program is organized into three components: Detection, Evaluation, and Intensive Site Ecosystem Monitoring. The Rocky Mountain Forest Health Management organization has the role of providing off-plot information as part of the detection monitoring component of the program. Off-plot monitoring has been implemented through the use of aerial photography of the installed plot system in Colorado and annual aerial surveys of the plot network. To date, a full suite of aerial photography has been acquired and photo-interpreted within a 25 acre circle of plot center.

In the future, off-plot monitoring will consist of aerial survey for Colorado and additional states entering the program.

SOME THOUGHTS ON THE BUFFALO CREEK FIRE AND DISTURBANCE ECOLOGY

On May 18, 1996, a fire started in the Ponderosa pine / Douglas-fir forest on the South Platte Ranger District, Pike National Forest. Before the fire was considered controlled, on May 24, 1996, approximately 11,900 acres of forest had burned. Of the burned area, 7,500 acres were considered consumed by high intensity fires. The forest that burned in the Buffalo Creek fire had been created by various climatic conditions, environmental influences, and multiple ecological processes. Perhaps the most influential ecological process to shape the predominately ponderosa pine landscape, historically and today, is fire.

It is widely accepted that historically natural and indigenous fire activity maintained ponderosa pine ecosystems with frequent fires of low to moderate intensity. Fire frequency in the short-interval regime ranges from 8 to 30 years and the intensity of the fires was dictated by the amount of available fuel on the forest floor. The fuel loading typically sustained surface fires and burnt in a mosaic pattern across the landscape. Consequently, the short-interval fire regime in the ponderosa pine type on the Front Range of Colorado maintained an open, park-like forest with large ponderosa pine in the over-story and shrub/grass combinations in the under-story. The "health" of the ponderosa pine ecosystem was directly dependent upon fire and proved to be resilient under this type of disturbance.

As more intense human activity on the landscape occurred, such as timber harvesting in the late 1800's and fire suppression activities beginning in the early 1900's, forest composition and structure changed from the open, park-like landscape. Response of the landscape to these and other activities brought forest vegetation into a more dense, multi-layered vegetation structure, a composition with higher percentages of shade tolerant species (Douglas-fir), and a reduction of open sites. Without the effects of disturbance on the landscape, presently a majority of the trees are less than 100 years old, and susceptible to insect and pathogen activity.

It was in this type of forest that the fire ignited and burned. Rather than a low to moderate fire intensity burning in a mosaic pattern, typical of the ponderosa pine type on the Front Range, the fire burned at higher intensities and in the crowns of trees. In the 7,500 acres of high intensity burn, soil erosion and loss of soil productivity is a major concern. Emergency short-term rehabilitation of the area provided for the sowing of sterile white oats for immediate soil stability and the placement of straw bales in several locations to prevent intense run-off and sediment delivery to the waterways. Long-term rehabilitation efforts are in the developmental stages on the South Platte Ranger District.

In the 1970's, this area of the South Platte Ranger District was part of a Designated Control Area (DCA) where cooperative efforts between the Colorado State Forest Service and USDA Forest Service led to aggressive direct control actions against mountain pine beetle. Many acres were thinned along Forest Highway 550 and the Spring Creek drainage. The value of thinning stands to prevent mountain pine beetle outbreaks is well demonstrated. These managed stands also played a role in the suppression action on this fire. Fire behavior was affected by the thinned areas, and fire suppression through air attack was much more effective than in the un-thinned stands. The thinned areas served as viable anchor points on the south and southeast side of the Buffalo Creek fire. While this fire had only one burn period, it was dramatic, moving 10 miles the first day and burning approximately 10,000 acres. Through the central section of the fire, where the burn intensity was highest, little management activity had been accomplished, though some was scheduled. A question arises: would the Buffalo Creek Fire of 1996 have burned this many acres and at the high fire intensity if the characteristics of the landscape had more closely resembled a fire maintained Ponderosa pine / Douglas-fir forest in the montane zone?

Since the fire in May 1996, the Buffalo Creek drainage system has flooded twice, summer grasses are growing in many areas, and the forest successional pathways have readjusted to the disturbance. Vegetative recovery or re-establishment of the area burned by the Buffalo Creek fire is a certainty in the long-term. In the short-term, the residual ecosystem, will

"recover" according to where and how a multitude of system conditions fit within or outside of the range of natural variability.

On the Colorado landscape, the locations of short-interval disturbance regimes, primarily the ponderosa pine ecosystems, are also the locations with the highest human densities. With the elimination of fire disturbance in the ponderosa pine ecosystem, a shift in forest vegetation from fire-tolerant species to fire-intolerant species has occurred. These forest conditions lead to larger, more severe disturbance events, and, ultimately, different successional pathways than fire-resilient ecosystem. (USDA - FS White paper, Disturbance Processes and Ecosystem Management, pg. 22).

Disturbance processes will continue, but effective stocking control of the forest composition has a definite impact on the magnitude of disturbance events, such as insects, pathogens, and fire, and the nature of ecosystem "recovery."

SUMMARY OF INSECT AND DISEASE CONDITIONS

STATUS OF INSECTS

DEFOLIATORS

Douglas-fir tussock moth
Orgyia pseudotsugata

Hosts: Douglas-fir, Engelmann spruce

Heavy defoliation declined from 6,134 acres in 1994 to 1,491 acres in 1995 on the South Platte river drainage of the Pike NF. Activity occurred as a "halo" around one population center, while the other, older center showed little to no activity. Some additional defoliation is expected in 1996. Evidence indicates that this epidemic, the first of significant size in recent Colorado history, is typical for the species elsewhere in its range. An early warning system using pheromone traps was installed and will be continued. Results for 1995 detected no additional areas of concern.

Western spruce budworm
Choristoneura occidentalis

Hosts: Douglas-fir, Engelmann spruce, Subalpine fir, White fir

Widespread defoliation of Douglas-fir, true firs and spruce continued throughout the forests of southern Colorado. Douglas-fir and true fir mortality is common in areas that have been repeatedly defoliated for almost a decade. Activity appears to be chronic in many areas, particularly on the Rio Grande NF. Defoliation has increased sharply on the Uncompahgre Plateau, indicating expanding populations. White fir defoliation at Amphitheater Campground, Ouray Ranger District, Uncompahgre NF, is continuing, though at lower levels than previously reported. Management activities are being implemented at this site to improve deteriorating stand conditions.

Pine tussock moth
Dasyschira grisefacta

Hosts: Ponderosa pine

No defoliation was reported in 1995.

Pine tussock moth...

Pines heavily defoliated in 1993 on private lands near Edgerton, WY, continue to die from the combined effects of defoliation and attack from Ips, as well as mountain pine beetle and red turpentine beetle. Impact plots that sustained defoliation of over 90% in 1993 showed 70-
80% mortality by 1995. Over the entire 5,000 acre area defoliated in 1993, roughly 15-25% of the pine cover type has died thus far. The mortality rate may decline, as the trees begin to recover from defoliation.

Gypsy moth - European variety
Lymantria dispar

Hosts: Hardwoods

In Colorado, a total of 1,842 gypsy moth detection traps were deployed throughout the State. In addition, a total of 213 traps were placed at 8 delimitation sites. Altogether, a total of six single catches were recorded throughout Colorado. These results indicate that there are no established infestations at this time. Two potentially serious introductions of gypsy moth were discovered in Colorado during 1994 - 1995. However, intensive trapping at both sites provided no evidence of infestations. Weather conditions during early spring, 1995, are thought to have been unfavorable for establishment of the moth. In South Dakota, eight moths were caught out of 619 detection survey traps placed throughout the state, including private campgrounds and residences. Moths were trapped in Brown, Custer, Jackson, Meade, and Pennington Counties. No moths were caught in 150 delimitation traps at six sites; three of the sites were located in areas where viable egg masses had been detected on nursery stock imported from Michigan. In Nebraska, only one moth was caught in the sprayed block near Bellevue. Six additional single catches were found near Omaha in Douglas and Burt Counties, locations where infested nursery stock had been outplanted. In Wyoming, a total of six gypsy moths were caught, one per trap, in or near the following communities: Laramie, DuBois, Wilson, Ten Sleep, Grant Village and Look-out Point. A delimitation survey is planned for each of these sites in 1996. Kansas reported

SUMMARY OF INSECT AND DISEASE CONDITIONS

DEFOLIATORS

Gypsy moth - European variety...

one catch near a housing development on Fort Leavenworth. In 1995, in cooperation with state and federal agencies, 1,100 traps were deployed statewide. Kansas will continue to monitor for gypsy moth establishment in 1996.

BARK BEETLES

Douglas-fir beetle
Dendroctonus pseudotsugae

Hosts: Douglas-fir

Douglas-fir beetle is active in many areas throughout Colorado. Much of this activity is associated with western spruce budworm defoliation. Of note, in 1995, scattered mortality from Bayfield to Pagosa Springs on the San Juan NF occurred. One area of concentrated activity, Dudley Creek, is of particular concern to resource managers. Mortality is expected to continue in these areas, although Douglas-fir beetle is not expected to achieve epidemic status. Mortality along the Colorado Front Range continues to occur in small, widely scattered groups. Most mortality is on steep inaccessible slopes where western spruce budworm has defoliated trees over the past decade. Additional mortality is occurring in areas heavily defoliated in the past 3 years by the Douglas-fir tussock moth. On the Shoshone NF, Wyoming, the epidemic continued to spread on the Clarks Fork and Wapiti Ranger Districts. About 4,500 trees were killed in 1995 between Sunlight Basin and Crandell Ranger Station and between Wapiti and Pahaska, Wyoming. The epidemic is expected to continue into 1996.

Mountain pine beetle
Dendroctonus ponderosae

Hosts: Limber pine, Lodgepole pine, Ponderosa pine

Increases in pine mortality indicate that mountain pine beetle populations may be increasing in several locales. The Uncompahgre

Mountain pine beetle...

Plateau on the Grand Mesa / Uncompahgre / Gunnison NF had two small outbreaks in 1995. Brood production was low in each case and it is uncertain whether populations will continue to grow in 1996. Mountain pine beetles are active in ponderosa pine on National Forest, private and residential properties near Buena Vista, CO, and will likely increase in 1996. Mountain pine beetles are also killing significant numbers of high elevation lodgepole pine in the Twin Lakes area of the San Isabel NF, Colorado. Some mountain pine beetle activity was also noted on the San Juan NF, although these populations tended to be associated with other bark beetles and could not be characterized as being in the outbreak phase. Moderate activity and damage was also observed at Buttermilk Ski Area, Aspen Ranger District, White River NF. Mortality in ponderosa pine near Laramie Peak, Wyoming, continued in 1995. An aerial survey of the areas is planned in 1996. Populations appear to be increasing near Edgerton, WY, in ponderosa pine that was heavily defoliated by pine tussock moth in 1993. From the Colorado-Wyoming border south throughout the Rocky Mountains, mortality appears to be on the rise. Nine areas of concern were identified in 1995 in both ponderosa and lodgepole pine. Tree mortality nearly doubled in the Black Hills of South Dakota from 1994 to 1995. Approximately 6,300 ponderosa pines were killed on 3,300 acres.

Western balsam bark beetle
Dryocoetes confusus

Hosts: Subalpine fir

Dryocoetes has become increasingly important as a mortality factor in stands of subalpine fir throughout the Rocky Mountains. Fire exclusion has resulted in conditions which favor subalpine fir and when these stands reach a mature state, they are highly susceptible to mortality caused by a root disease/Dryocoetes complex. Although this mortality is widely scattered, significant beetle impacts were observed at many important recreation areas, including Aspen Mountain, Aspen Highlands, Snowmass, and Crested Butte Ski areas. Mortality was common throughout the spruce/fir forest cover type from the Colorado-Wyoming border south throughout the Rocky Mountains. Additional factors, especially Armillaria root disease and

BARK BEETLES

Western balsam bark beetle...

possibly other biotic and abiotic components, are acting together to produce this mortality. Areas near Centennial, WY, and Kremmling and Leadville, CO, have especially concentrated areas of mortality. Aerial survey and field confirmation in portions of Colorado documented 6,313 dead subalpine fir on 1,756 acres. Efforts are underway to determine the causes, extent, impact, and mitigation measures possible to deal with this mortality complex.

STATUS OF DISEASES

STEM AND BRANCH DISEASES

Dwarf Mistletoe
Arceuthobium americanum

Hosts: Lodgepole pine

Dwarf mistletoes cause the greatest disease losses in Region 2. Losses equal at least 10 million cu.ft. annually. FHM funded presuppression surveys on 64,733 acres on four National Forests and silvicultural control on 2,179 acres on six National Forests. In addition, 4,500 acres of DOI lands were surveyed and 325 acres were treated. In Colorado, 50% of the lodgepole pine cover type is infected. It is widespread in some areas of the Bighorn National Forest, though not yet a management concern.

Dwarf Mistletoe
Arceuthobium douglasii

Hosts: Douglas-fir

Dwarf mistletoe on Douglas-fir occurs mostly in the southern two-thirds of Colorado. FHM provided funds for silvicultural control on 26 acres on the Salida Ranger District, San Isabel NF. It was also identified as a management concern at Mt. Princeton Campground, Salida RD, and North Park Salvage Wildlife Units, Saguache Ranger District, Rio Grande NF.

Dwarf Mistletoe
Arceuthobium vaginatum subsp.cryptopodium

Hosts: Ponderosa pine

Losses of Ponderosa pine due to Dwarf mistletoe amount to 885,000 cu. ft. annually in Colorado. In 1995, FHM provided funds for silvilcultural control on 109 acres on the Southern Ute Reservation and 51 acres on the Salida Ranger District, San Isabel National Forest. Suppression projects emphasized tree removal and pruning of infected trees in developed recreation areas.

ROOT DISEASES

Armillaria root disease
Armillaria spp.

Hosts: Conifers and Hardwoods

Armillaria root disease is easily the most common and damaging of the root diseases in Region 2. In 1995, the disease was identified as a factor affecting management in various locations in all of the National Forests of Region 2. Armillaria root disease, together with the western balsam bark beetle, Dryocoetes confusus, is a major problem in the spruce/fir cover type of Aspen Mountain and Crested Butte ski areas, and is active, though not yet damaging at Aspen Highlands and Snowmass ski areas. In South Dakota, this root disease continues to cause mortality of spruce and ponderosa pine on the Black Hills National Forest. Survey work continues on the Black Hills NF to discover the distribution and severity of Armillaria. One-hundred and four vegetative isolates of Armillaria from various infected trees, including ten host species from 11 National Forests throughout Colorado, South Dakota, and Wyoming, have been identified as the biological species Armillaria ostoyae. Work will continue in 1996 on the identification of additional collections.

Black Stain root disease
Leptographium wageneri

Hosts: Pinon pine, Ponderosa pine

SUMMARY OF INSECT AND DISEASE CONDITIONS

ROOT DISEASE

Black Stain root disease...

This disease continues as a problem on pinon pine in the southwestern corner of Colorado. Recent widespread mortality was detected on BLM land just south of Redvale, CO. The disease is of concern in some recreational areas near McPhee Reservoir and at Mesa Verde National Park, CO.

VASCULAR DISEASES

Dutch Elm Disease
Ceratosystis ulmi

Hosts: Elm species

In Colorado, Dutch elm disease reports increased dramatically over past years. Hundreds of trees were removed in the Denver metro area in 1995. In Kansas, the disease is a serious problem in many urban areas; however, reports were about normal in 1995. In Nebraska, incidence of the disease was greater in 1995 than in recent years.

FISCAL YEAR 1995

ROCKY MOUNTAIN INSECT AND DISEASE

STATUS REPORT

INSECT	HOST	LOCATION	REMARKS
A willow sawfly *Nematus* sp.	Willow	South Dakota, Wyoming	No significant activity reported in 1995.
Ash plant bug *Tropidosteptes amoneus*	Green ash	South Dakota	Activity was high, but slightly lower than in 1994.
Aspen leaf beetle *Chrysomela crotchi*	Aspen	South Dakota	No significant activity reported in 1995.
Balsam twig aphid *Mindarus abietinus*	Balsam fir	South Dakota	No significant activity reported in 1995.
Birch skeletonizer *Bucculatrix canadensisella*	Birch	South Dakota	No significant activity reported in 1995.
Black-headed ash sawfly *Tethida cordigera*	Green ash	South Dakota	Reduced population levels in 1995. Perhaps a response to rains occurring during hatch in the late spring.
Bronze birch borer *Agrilus anxius*	Paper birch	Nebraska, South Dakota	In Nebraska, the borer is common in urban areas in the eastern part of the state. Westward spread of the insect has occurred and in 1995, 60-80% of the birch is affected in western Nebraska.
Brown-headed ash sawfly *Tomostethus multicinctus*	Green ash	Colorado	No significant activity reported in 1995.
Bull pine sawfly *Zadiprion townsendi*	Ponderosa pine	Colorado	No significant activity reported in 1995.

INSECT	HOST	LOCATION	REMARKS
Cankerworms *Alsophila pometaria* *Paleacrita vernata*	Bur oak, Elm, Green ash, Hackberry, Honeylocust	Kansas, South Dakota, Wyoming	In South Dakota, insect activity in the central part of the state was moderate to heavy in urban and floodplain locations for 1995.
Chafer *Diplotuxis obscura*	Ponderosa pine	Colorado	Low levels of activity in 1995. A few reports of adult swarming and pine defoliation were received from an area just east of Colorado Springs, CO.
Common European pine beetle *Tomicus piniperda*	Scotch pine, White pine	Kansas	Beetle has not been reported in Kansas.
Common falsepit scale *Lecanodiaspis prosopidis*	Green ash, Hackberry, Red mulberry	Colorado	No significant activity reported in 1995.
Cottonwood borer *Plectrodera scalator*	Cottonwood	South Dakota	No significant activity reported in 1995.
Cottonwood leaf beetle *Chrysomela scripta*	Poplars	Colorado, South Dakota	No significant activity reported in 1995.
Dioryctria pine moths South *Dioryctria* sp.	Austrian pine, Pinon pine, Ponderosa pine, Scotch pine	Colorado, Nebraska, South Dakota	No change reported in infestation levels in Nebraska and Dakota in 1995.

INSECT	HOST	LOCATION	REMARKS
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Colorado, Wyoming	Mortality along the Colorado Front Range continues to occur in small, widely scattered groups. Most mortality is on steep inaccessible slopes where western spruce budworm has defoliated trees over the past decade. Additional mortality is occurring in areas heavily defoliated in the past 3 years by the Douglas-fir tussock moth. Of note in 1995 was scattered mortality from Bayfield to Pagosa Springs, on the San Juan NF, in Colorado. Mortality is expected to continue in these areas. On the Shoshone NF in Wyoming, the epidemic continues to spread on the Clarks Fork and Wapiti Ranger Districts. About 4,500 trees were killed in 1995 between Sunlight Basin and Crandell Ranger Station and between Wapiti and Pahaska. The epidemic is expected to continue into 1996. Populations in South Dakota are declining from the high insect numbers in 1994.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir	Colorado	Heavy defoliation declined from 6,134 acres in 1994 to 1,491 acres in 1995 on the South Platte river drainage of the Pike NF. Activity occurred as a "halo" around one population center, while the other, older center showed little to no activity. Some defoliation is expected in 1996. Evidence indicates that this epidemic, the first such of significant size in recent Colorado history, is declining rapidly, having exhibited a pattern typical for the species elsewhere in its range. An early warning system using pheromone traps was installed and will be continued. Results for 1995 detected no addition areas of concern.
Elm calligrapha *Calligrapha scalaris*	Siberian elm	South Dakota	No significant activity reported in 1995.
Elm leaf beetle *Xanthogaleruca luteola*	American elm, Siberian elm	Colorado, Kansas, Nebraska, South Dakota	No significant activity reported in 1995 for Colorado, Kansas, or South Dakota. In Nebraska, activity is common in urban areas where moderate defoliation occurred.

INSECT	HOST	LOCATION	REMARKS
European pine sawfly *Neodiprion sertifer*	Scotch pine	Kansas, Nebraska, South Dakota	In Kansas, reports of damage in Christmas tree plantations is common in the eastern part of the state. In eastern Nebraska, populations remained high in 1995, but lower than in recent years.
Fall webworm *Hyphantria cunea*	Cottonwood	Colorado, Kansas, South Dakota, Wyoming	Kansas reports light damage in the northeastern and moderate damage in the southeastern parts of the state. In South Dakota, activities statewide were reported as moderate to high in 1995.
Flea beetle *Altica* sp.	Cottonwood	Colorado	No significant activity reported in 1995.
Grape mealybug *Pseudococcus maritimus*	Catalpa, Honeylocust	Colorado	No significant activity reported in 1995.
Greenstriped mapleworm *Dryocampa rubicunda*	Silver maple	Kansas	Moderate defoliation was reported in the eastern part of the state in urban and recreation areas.
Gypsy moth *Lymantria dispar*	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	In Colorado, surveys continue statewide on state, private, and federal lands. During 1996, a total of 1,832 detection traps were deployed. An additional 213 delimitation traps were placed surrounding the previously positive traps sites. A total of six moths were caught in detection traps in 1995, one per site in the following areas: Denver, Lakewood, Boulder, Kremmling, Larimer County near LaPorte, and on the US Air Force Academy grounds near Colorado Springs. The delimitation trapping caught one moth in Boulder. Delimitation trapping will be done around all 1996 catches. Detection trapping will be expanded to include additional federal sites in 1996. In Wyoming, a total of six gypsy moths were caught, one per trap, in or near the following communities: Laramie, DuBois, Wilson, Ten Sleep, Grant Village and Look-out Point. A delimitation survey is planned for each site in 1996.

INSECT	HOST	LOCATION	REMARKS
Gypsy moth (continued) *Lymantria dispar*	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	In South Dakota, eight moths were caught from the 619 detection survey traps placed statewide, all on private campgrounds or residences. Moths were found in the following counties: Brown, Custer, Jackson, Meade, and Pennington. No moths were caught in 150 delimitation traps at six sites, three of which were located where viable egg masses had been detected on nursery stock imported from Michigan. In Nebraska, only one moth was caught in the sprayed block near Bellevue. Six additional single catches were made near Omaha in Douglas and Burt counties, sites where infested nursery stock had been outplanted. In Kansas, one moth was caught at Fort Leavenworth. A total of 1,100 traps were placed statewide in 1995. Trapping will continue in 1996 in Kansas.
Hackberry caterpillar *Asterocampa celtis*	Hackberry	Kansas	No significant activity reported in 1995.
Hackberry galls *Pachypsylla celtidismamma* *Pachypsylla celtidisversicula*	Hackberry	Colorado, South Dakota	No significant activity reported in 1995.
Honeysuckle aphid *Hyadaphis tataricae*	Honeysuckle	Kansas, South Dakota	A very serious pest througout the state of Kansas, particularly in windbreaks.
Juniper sawfly *Monoctenus fulvus*	Eastern redcedar, Rocky Mountain juniper	Kansas	No significant activity reported in 1995.
Lilac borer *Podosesia syringae*	Green ash, Lilac	Colorado, Kansas, Nebraska, South Dakota	No significant activity reported in 1995.

INSECT	HOST	LOCATION	REMARKS
Mountain pine beetle *Dendroctonus ponderosae*	Limber pine, Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Mortality in ponderosa pine near Laramie Peak, Wyoming, continues in 1995. An aerial survey of the area is planned in 1996. Near Edgerton, WY, populations appear to be increasing in ponderosa pine that was heavily defoliated by pine tussock moth in 1993. From the Colorado - Wyoming border south throughout the Rocky Mountains, mortality appears to be on the rise, with at least nine areas of concern identified in 1995 in ponderosa and lodgepole pine. Aerial survey results of select portions of this area identified 3,996 dead trees on 2,717 acres. The Uncompahgre Plateau on the Grand Mesa / Uncompahgre / Gunnison NF had two small outbreaks in 1995. Mountain pine beetle activity in ponderosa pine near Buena Vista, CO, will likely increase in 1996. Additionally, significant numbers of high elevation lodgepole pine in the Twin Lakes areas of the San Juan NF are dying due to beetle activity. Favorable conditions for MPB could lead to a large outbreak in a few years. Tree mortality nearly doubled in the Black Hills of South Dakota from 1994 to 1995. Approximately 6,300 ponderosa pine trees were killed on 3,300 acres.
Pine engraver beetle *Ips* spp.	Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	One area of 400 Ips-killed ponderosa pine was mapped from the air south of Castle Rock,CO, where there is new housing construction. In Wyoming, Ips mortality was light to moderate across the 5,000 acres of ponderosa pine that was heavily defoliated by the pine tussock moth in 1993. Half the dead pines impact plots had been attacked by Ips. Small pockets of top killing and tree mortality continued to be present in ponderosa pine, especially in to southern Black Hills in South Dakota. Populations built up at Mt. Rushmore National Memorial where thinning activity was on-going; pheromone traps where used to reduce infestations.
Ips confusus	Pinon pine	Colorado	Increasing mortality of pinon pine was reported in the areas to the east and southeast of the Uncompahgre Plateau. Many of the dead trees in this area were infested with pinon Ips, but the primary factor responsible for this mortality is likely black stain root disease (*Leptographium wageneri*).

INSECT	HOST	LOCATION	REMARKS
Pine sawflies *Neodiprion autumnalis* *Neodiprion fulviceps*	Ponderosa pine	Colorado, South Dakota, Wyoming	Populations increased in western South Dakota, with heavy infestations present in the Piedmont, Black Hawk, and Rapid City areas. In Colorado, some local defoliation occurred near Calhan, CO; however, in general, populations have declined in this area.
Pine tip moths *Rhyacionia bushnelli* *Rhyacionia frustrana* *Rhyacionia neomexicana*	Austrian pine, Ponderosa pine, Scotch pine, Virginia pine	Colorado, Nebraska, Kansas, South Dakota, Wyoming	In Kansas, reports of *Rhyacionia frustrana* varied across the state; however, in the south-central section of the State some Christmas tree plantations reported heavy infestations.
Pine tussock moth *Dasychira grisefacta*	Ponderosa pine	Colorado, Nebraska, South Dakota, Wyoming	No defoliation was reported in 1995. Pines heavily defoliated in 1993 on private lands near Edgerton, WY, continue to die from a combination of defoliation and attack from Ips, as well as mountain pine beetle and red turpentine beetle. Impact plots defoliated over 90% in 1993, roughly 15 to 25% of the pine cover type, has died thus far since 1993. The mortality rate may decline soon, as trees recover from defoliation.
Pinyon needle scale *Matsucoccus acalyptus*	Pinyon pine	Colorado	In 1995, activity near Buena Vista, CO, declined; however, many trees impacted by the 1994 infestation are dying of unknown causes.
Pinyon pitch-nodule moth *Retinia arizonensis*	Pinon pine	Colorado	No significant activity reported in 1995.
Red turpentine beetle *Dendroctonus valens*	Jack pine, Ponderosa pine	Nebraska, South Dakota, Wyoming,	Beetle attacks are common on stressed trees near Edgerton, WY, that were heavily defoliated by the pine tussock moth in 1993. Mortality is attributed primarily to *Ips* and the effects of defoliation, but *D. valens* also attacked many trees that died.

INSECT	HOST	LOCATION	REMARKS
Smaller European elm bark beetle *Scolytus multistriatus*	Elm	Colorado	Populations remain high as a result of the fall freeze of 1991 and will probably remain so as a result of the September 1995 snowstorm damage to trees along the Front Range of Colorado.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Colorado, Wyoming	Although significant amounts of windthrow were experienced throughout Colorado in the spring of 1995, only small numbers of spruce beetle were found. The vast majority of the downed spruce had been infested by *Ips pilifrons*. Also, along the I-70 corridor from Idaho Springs to Georgetown, CO, spruce beetle activity is continuing. In Wyoming, populations were low.
Tent caterpillars *Malacosoma americanum* *Malacosoma californicum* *Malacosoma disstria*	American plum, Aspen, Chokecherry, Hardwoods	Colorado, Kansas, South Dakota, Wyoming	No significant activity reported in 1995.
Tiger moth *Lophocampa ingens*	Douglas-fir, Pinon pine, Ponderosa pine, White fir	Colorado	High incidence of tents in the pinon pine, ponderosa pine, white fir, and Douglas-fir in the area of Raton Pass, Boncardo, Stonewall, and the Black Forest, Colorado, in 1995.
Twig beetles *Pityophthorus* spp. *Pityogenes* spp.	Pinon pine, Ponderosa pine	Colorado	In 1995, moderate levels were reported in the Black Forest, Colorado, on ponderosa pine.
Ugly nest caterpillar *Archips cerasivorana*	Chokecherry	South Dakota	No significant activity reported in 1995.
Walnut caterpillar *Datana integerrima*	Black walnut, Bur oak, Hickory, Pecan	Kansas, Nebraska	No significant activity reported in 1995.

INSECT	HOST	LOCATION	REMARKS
Walnut trunk-webbing *Gretchena concitatricana*	Walnut	Kansas, Nebraska	No significant activity reported in 1995.
Web-spinning sawflies *Acantholyda* spp. *Cephalcia* spp.	Colorado blue spruce, Ponderosa pine	Colorado	Activity levels decreased in 1995.
Western balsam bark *Dryocoetes confusus*	Subalpine fir	Colorado, Wyoming	Mortality was common throughout the spruce/fir cover type from the Wyoming - Colorado border south throughout the Rocky Mountains. Additional factors, especially Armillaria root disease and possibly other biotic and abiotic components, are acting together to produce this mortality. Areas near Centennial, WY, and Kremmling and Leadville, CO, have especially concentrated areas of mortality. Aerial and field surveys documented 6,313 dead subalpine fir on 1,756 areas. Efforts are underway to determine the causes, extent, impact, and mitigation measures possible to deal with this mortality complex.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Colorado	No significant activity reported in 1995.
Western spruce budworm *Choristoneura occidentalis*	Blue spruce, Douglas-fir, Engelmann spruce, True firs	Colorado, Wyoming	Widespread defoliation of Douglas-fir, true firs, and spruce contined throughout the forests of southern Colorado in 1995. Douglas-fir and true fir mortality is common in areas that have been repeatedly defoliated for almost a decade. Activity appears to be chronic in many areas, particularly on the Rio Grande NF. Defoliation has increased sharply on the Uncompahgre Plateau, indicating expanding populations. White fir defoliation at Amphitheater Campground, Ouray RD, Uncomphagre NF, is continuing, though at lower levels than previously reported. In 1995, defoliated acreage in southern Colorado was estimated to be 97,000 acres.

INSECT	HOST	LOCATION	REMARKS
White pine weevil *Pissodes strobi*	Colorado blue spruce	Colorado	No significant activity reported in 1995.
Yellow-necked caterpillar *Datana ministra*	Basswood, Elm, Fragrant sumac, Maple, Oak	Kansas	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
STEM AND BRANCH DISEASES			
Black knot *Apiosporina morbosum*	Chokecherry	Colorado, South Dakota	Chokecherry in riparian zones throughout Colorado and western South Dakota is commonly affected by this disease. Black Knot is common at the Amphitheater Campground on the Ouray Ranger District, Uncompahgre NF.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	The disease is present in northern Colorado, western South Dakota, and Wyoming, but is of concern in only a few areas. The disease is of major concern on the Bighorn, Medicine Bow, and Shoshone National Forests in Wyoming. It is of particular management concern along the eastern edge of the Medicine Bow NF adjacent to sagebrush habitat containing the alternate host, *Comandra* spp.
Elytroderma needle cast *Elytroderma deformans*	Ponderosa pine	South Dakota	No significant activity reported in 1995.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Colorado, Wyoming	This disease is common throughout the spruce/fir cover type in Colorado and south-central Wyoming, where it causes only minor damage. Brooms are scattered on older subalpine fir in the Bighorn NF, Wyoming.
Fire blight *Erwinia amylovora*	Apple species, Cotoneaster, Crabapple	Colorado, South Dakota, Wyoming	In South Dakota, widespread damage continues.
Kabatina tip blight *Kabatina juniperi*	Eastern red cedar, Rocky Mountain juniper	Kansas	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
STEM AND BRANCH DISEASES			
Pine tip blight *Sphaeropsis elisii*	Austrian pine, Ponderosa pine	Kansas	Reports of damage continues to increase, especially in urban areas and windbreaks.
Poplar shoot blight *Venturia macularis*	Aspen	Colorado	Common on aspen regeneration in many locations in Colorado.
Spruce broom rust *Chyrysomyxa arctostaphyli*	Blue spruce, Engelmann spruce, White spruce	Colorado, South Dakota	Common throughout the spruce/fir type in Colorado, where it generally causes only minor damage. The disease is common in Engelmann spruce at Aspen Mountain Ski Area, and was identified as a management concern in several campgrounds on the Divide RD, Rio Grande NF.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota, Wyoming	No significant increase of activity reported for Colorado, South Dakota, or Wyoming, in 1995. Continues as moderate to severe problem in central and eastern Nebraska.
White pine blister rust *Cronartium ribicola*	Limber pine, White pine	South Dakota, Wyoming	Branch mortality is common and is a management concern in the Vedauwoo Campground, Medicine Bow NF, Wyoming, as is the heavy branch and tree mortality in the Sunlight area of the Shoshone NF, Wyoming. The disease has been identified in a remote stand in the Black Hills, South Dakota.
Black target canker *Ceratocystis fimbriata*	Aspen	Colorado	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
CANKER DISEASES			
Botryodiplodia *Botryodiploda* spp.	Juniper	Kansas	No significant activity reported in 1995.
Botryosphaeria stevensii	Eastern red cedar, Rocky Mountain juniper	Kansas, Nebraska	No significant activity reported in 1995.
Cytospora canker *Cytospora* spp. *Leucocytospora* spp.	Aspen, Cottonwood, Poplar, Spruce, Willow	Colorado, Kansas, Nebraska, South Dakota, Wyoming	This disease is common on aspen throughout Colorado where it is a management concern in recreation, riparian and regeneration areas. Cytospora canker was noted at Cottonwood Lake Campground on the Salida RD, San Isabel NF, and is affecting management of aspen at the Clear Creek Timber Sale Area on the Norwood RD, Uncompahgre NF.
Cryptosphaeria canker *Cryptosphaeria populina*	Aspen	Colorado, South Dakota	This canker is common in many aspen stands throughout Colorado. The disease was noted as one of many factors affecting management in the Clear Creek Timber Sale Area, Norwood RD, Uncompahgre NF.
Grovesiella canker *Grovesiella abietina*	Subalpine fir	Wyoming	No significant activity reported in 1995.
Russian olive canker *Phomopsis arnoldiae* *Tubercularia* sp. *Lasiodiplodia* sp.	Russian olive	Kansas, Nebraska, South Dakota, Wyoming	This disease continues to be a very serious problem in the eastern half of Kansas.
Siberian elm canker *Botryodiplodia hypoderma* *Tubercularia ulmea*	Siberian elm	Colorado, Nebraska, South Dakota, Wyoming	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
CANKER DISEASES			
Sooty bark canker *Encoelia pruinosa*	Aspen	Colorado	Sooty bark canker is a common disease in aspen stands in Colorado. It was noted as one of many factors affecting management in the Clear Creek Timber Sale Area, Norwood RD, Uncompahgre NF.
Thyronectria canker *Thyronectria austro-americana*	Honeylocust	Colorado, Kansas, Nebraska	In Kansas, honeylocust has been eliminated in older windbreaks. Kansas and Nebraska report normal levels of activity in 1995.
DWARF MISTLETOE			
Arceuthobium americanum	Lodgepole pine	Colorado, Wyoming	Dwarf mistletoes cause the greatest disease losses in Region 2. Losses equal at least 10 million cu. ft. annually. In Colorado, 50% of the lodgepole pine type is infected. Forest Health Management funded presuppression surveys on 64,733 acres on nine National Forests, silvicultural control on 895 acres on six NF's. Sanitation thinning was also completed in 11 campgrounds on the Gunnison and San Isabel NF's. At the Piney Analysis Area, Holy Cross RD, White River NF, 17% of the acres with lodgepole pine was found to be infested. The lodgepole pines at Aspen Highlands Ski Area are heavily impacted by this disease. Dwarf mistletoe incidence is widespread on the Bighorn and Shoshone NF in Wyoming.
Arceuthobium cyanocarpum	Limber pine	Colorado	Limber pine dwarf mistletoe continued as a minor problem.
Arceuthobium divaricatum	Pinon pine	Colorado	Pinon pine dwarf mistletoe continued as a minor problem in western Colorado in 1995. However, perceived impacts of the disease are becoming more evident as people move into the pinon/juniper woodlands of southern Colorado.

DISEASE	HOST	LOCATION	REMARKS
DWARF MISTLETOE			
Arceuthobium douglasii	Douglas-fir	Colorado	Occurs mostly in the southern two-thirds of Colorado. Forest Health Management provided funds for silvicultural control on 26 acres on the Salida RD, San Isabel NF. It was also identified as a management concern at Mt. Princeton Campground, Salida RD, and in the North Park Salvage Wildlife Units, Saguache RD, Rio Grande NF.
Arceuthobium vaginatum subsp. *cryptopodium*	Ponderosa pine	Colorado	Losses amount to 885,000 cu.ft. annually. In 1995, Forest Health Management provided funds for silvicultural control of 109 acres on the Southern Ute Reservation and 51 acres on the Salida RD, San Isabel NF. Suppression projects emphasized tree removal and pruning of infested trees in developed recreation sites.
DECAY DISEASES			
Ash heartrot *Perennipora fraxinophilus*	Green ash	South Dakota	No significant activity reported in 1995.
Aspen trunk rot *Phellinus tremulae*	Aspen	Colorado, South Dakota	Aspen trunk rot is common throughout the aspen cover type in Colorado. In South Dakota recreation areas, trees with this disease are removed to reduce hazard potential. White trunk rot was identified as a management concern in several stands in the Clear Creek Timber Sale Area of the Norwood Ranger District, Uncompahgre National Forest. Heartwood decay due to this rot is widespread throughout aspen stands in the Black Hills National Forest.
Red ray rot *Dichomitus squalens*	Ponderosa pine	South Dakota	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
DECAY DISEASES			
Red ring rot *Phellinus pini*	Subalpine fir	Wyoming	No significant activity reported in 1995.
White mottled rot *Ganoderma applanatum*	Aspen	Colorado	The disease is common in aspen throughout Colorado, and is a source of potential hazard in campgrounds and recreation areas. However, no new reports of the disease were made in 1995.
ROOT DISEASES			
Annosus root disease *Heterobasidion annosum*	Jack pine, Ponderosa pine, White fir	Colorado, Nebraska	Annosus root disease has scattered distribution in white fir in the mixed conifer cover type throughout southern Colorado. The disease is present and is responsible for a tree failure in the Amphitheater Campground, Ouray RD, Uncompahgre NF.
Armillaria root disease *Armillaria* spp.	Engelmann spruce, Hardwoods, Lodgepole pine, Ponderosa pine, Subalpine fir, White fir	Colorado, South Dakota, Wyoming	Armillaria root disease is easily the most common and damaging of the root diseases in Region 2. The disease is commonly associated with the decline of subalpine fir caused by several bark beetles (Scolytus/Dryocoetes) throughout Colorado and Wyoming. In 1995, the disease was identified as a factor affecting management in various locations in all the National Forests served by the Gunnison Service Center zone (southwestern Colorado). In South Dakota, Armillaria root disease continues to cause mortality of spruce and ponderosa pine in the Black Hills NF.
Black stain root disease *Leptographium wageneri*	Pinon pine, Ponderosa pine	Colorado	Continues as a problem on pinon pine in the southwestern corner of Colorado. Recent widespread mortality was detected on BLM land south of Redvale, CO. The disease is also of major concern in recreation areas near McPhee Reservoir and at Mesa Verde National Park, CO.

DISEASE	HOST	LOCATION	REMARKS
ROOT DISEASES			
Leptographium root disease *Leptographium terebrantis*	Jack pine, Ponderosa pine	Nebraska, South Dakota	No significant activity reported in 1995.
FOLIAGE DISEASES			
Anthracnose *Gnomonia leptostyla*	Walnut	Kansas	No significant activity reported in 1995.
Apiognomonia veneta *= Gnomonia platani* *Discula* sp.	Ash, Maple, Sycamore	Colorado, Kansas, Wyoming	In Kansas, Anthracnose was very severe in eastern part of the state in 1995. It was reported as one of the worst years in the last 30 years for disease activity. The wet cool spring weather was very favorable to disease development.
Gnomoniella fraxini	Green ash	South Dakota	No significant activity reported in 1995.
Ash leaf rust *Puccinia sparganioides*	Green ash	Colorado, Kansas, Nebraska, South Dakota	In eastern South Dakota, very high levels of disease damage in urban areas was reported in 1995.
Aspen leaf blights *Ciborina whetzelii* *Marssonina populi*	Aspen	Colorado, South Dakota	Found throughout the aspen type, the disease created great aesthetic concern. Because of unusually cool, wet conditions throughout Colorado and Wyoming in the late spring of 1995, incidence and severity of these diseases were very high. As a result, the fall foliage color change was generally poor.
Brown spot needle blight *Scirrhia acicola* *Mycosphaerella dearnessii*	Scotch pine	Kansas, Nebraska	Kansas had higher than normal levels of brown spot needle blight reported in 1995. Christmas tree growers reported removal and destruction of trees due to the severity of the disease.

DISEASE	HOST	LOCATION	REMARKS
FOLIAGE DISEASES			
Cedar apple rust *Gymnosporangium juniperi-virginiana*	Apple species, Eastern red cedar	Colorado, Kansas, Nebraska, South Dakota, Wyoming	No significant activity reported in 1995.
Gymnosporangium nelsonnii	Rocky Mountain juniper, Serviceberry	Colorado	No significant activity reported in 1995.
Cercospora blight of juniper *Cercospora sequoiae*	Eastern red cedar, Rocky Mountain juniper	Kansas, Nebraska	Cercospora continued to be a problem in the eastern parts of both states in 1995.
Conifer-aspen rust *Melampsora medusae*	Aspen, Douglas-fir, Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota	Like the aspen foliage diseases, conifer-aspen rust causes great aesthetic concern but little permanent damage to the host trees. Disease levels were low in 1995.
Diplodia blight *Sphaeropsis sapinea* *Diplodia pinea*	Ponderosa pine, Lodgepole pine	Nebraska, South Dakota, Wyoming	This fungus, first found on 2-0 lodgepole pine seedlings at the USFS Nursery, Halsey, NE, in 1994, was not reported in 1995. Damage appeared to increase in the Black Hills of South Dakota in recent years. The increase is due in part to the wet spring weather and severe hailstorm events.
Dothistroma needle blight *Dothistroma pini* *Mycosphaerella pini*	Austrian pine, Ponderosa pine	Kansas, Nebraska	Severe levels occurred again in the eastern parts of both states in 1995.
Leaf shothole *Cylindrosporium* sp.	Black cherry, Chokecherry	Nebraska, South Dakota	No significant activity reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
FOLIAGE DISEASES			
Melampsora leaf rusts *Melampsora* spp.	Aspen, Cottonwood, Willow	Colorado, Kansas	No significant activity reported in 1995.
Needle casts *Lophodermella concolor* *Lophodermella montivaga*	Lodgepole pine	Colorado, Wyoming	No significant activity was noted in 1995.
Phomopsis blight *Phomopsis juniperovora*	Eastern red cedar, Rocky Mountain juniper	Nebraska, South Dakota	No significant activity was noted in 1995.
Septoria leaf spot *Septoria caraganae*	Caragana	Kansas, South Dakota	No significant activity was noted in 1995.
VASCULAR WILTS AND DECLINES			
Ash decline	Green ash	Colorado	No significant activity was noted in 1995.
Dutch elm disease *Ceratocyocystis ulmi* *Ophiostoma ulmi*	Elm species	Colorado, Kansas, Nebraska, South Dakota	In Colorado, disease losses were high in Denver, Sterling, Ft. Morgan, Canon City, and Pueblo in 1995. Nebraska reported greater incidences of the disease in 1995 throughout the state.
Oak wilt *Ceratocystis fagacaerum*	Oak species	Kansas, Nebraska	No significant activity was noted in 1995.

DISEASE	HOST	LOCATION	REMARKS
VASCULAR WILTS AND DECLINES			
Pinewood nematode *Bursaphelenchus xylophilus*	Austrian pine, Scotch pine, White pine	Kansas, Nebraska	Pinewood nematode remains a serious problem in the eastern part of Kansas; however, movement to the west appears to have slowed.
Verticillium wilt *Verticillium* spp.	Catalpa, Maple, Redbud, Russian Olive	Kansas, South Dakota	Normal levels of activity for Kansas in 1995. South Dakota reported a slight increase of activity in 1995 from the previous year.
ABIOTIC			
Chemical damage	Many hardwood species	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Toxic gas emissions (methane, carbon monoxide, hydrogen sulfide, etc.) above subsurface coal beds at Vallencia Canyon on the Southern Ute Reservation caused widespread mortality of pinon pine and juniper along one-half to two-thirds mile long strips of land.
Cottonwood mortality	Cottonwood	Colorado	No significant activity was noted in 1995.
Drought and other agents	Black walnut, Blue spruce, Buffaloberry, Dogwood, Green ash, Pear, Ponderosa pine, Poplar, Russian olive, Siberian elm, Silver maple	Colorado, Nebraska, Kansas, South Dakota, Wyoming	The prolonged drought that has affected the Region abated somewhat with the coming of heavy rains and snowfall in the spring of 1995. No significant impacts due to drought were reported in 1995.

DISEASE	HOST	LOCATION	REMARKS
ABIOTIC			
Flooding/Heavy Rains/ Saturated Soils	Colorado spruce, Cottonwood, Ponderosa pine,	Colorado, Kansas, Nebraska, Wyoming	No significant activity reported in 1995.
Frost damage	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Unusually warm winter and early spring climate throughout much of Colorado in 1994 resulted in an early flush of leaves. Hard frosts on April 25 caused widespread foliage loss, particularly in ornamental green ash and honeylocust; however, recovery is expected.
Snow damage	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Unusually early and significant snowfall, ranging from one to nine inches, occurred in portions of eastern Colorado, western Kansas, and western and central Nebraska on September 20, 1995. Fully-foliated trees were particularly susceptible to limb and branch breakage. Species most affected were cottonwood, green ash, elm, and willows. Communities in the Denver area were most affected and clean-up operations took several weeks.
Wind damage	Engelmann spruce Subalpine fir	Colorado	Strong winds and above average springtime precipitation (resulting in saturated soils) were responsible for scattered groups of blowdown over large areas of Colorado. Several areas had significant blowdown. A quarter of a million board feet of spruce in Fern Creek drainage, near Creede, CO, blew over in addition to 60,000 board feet just west of Wolf Creek Pass, Colorado. Scattered windthrow and breakage was also reported at Beaver Lake Campground, Ouray RD, Uncompahgre NF.
Winter drying	Engelmann spruce, Subalpine fir	Colorado	Numerous winter burned spruce and fir were observed at Snowmass Ski Area.

PESTICIDE USE IN REGION 2 IN FISCAL YEAR 1995

Type of Pesticide	*Chemical Used* [1/]	*Primary Mgmt. Activity*	*Units Treated in Acres*
Fumigant	Dazomet	Nursery bed sterilization Mgmt.	11 acres
	Chloropicrin/ Methyl Bromide	Nursery bed sterilization Mgmt.	8 acres
Fungicide	Chlorothalonil	Fungi Mgmt.	35 acres
	Dodine	Fungi Mgmt.	.5 acres
	Thiophanotemethyl	Fungi Mgmt.	31 acres
Herbicide	Bromacil/Diuron	Vegetation Mgmt.	332 acres
	Chlorosulfron	Noxious Weed Mgmt.	26 acres
	Clopyralid	Noxious Weed Mgmt.	36 acres
	2,4-D/Clopyralid	Noxious Weed Mgmt.	588 acres
	2,4-D	Noxious Weed Mgmt. Vegetation Mgmt. Wildlife Habitat Improvement	4,858 acres
	Dicamba	Noxious Weed Mgmt.	984 acres
	Diuron	Vegetation Mgmt. Noxious Weed Mgmt.	199 acres
	Fosamine ammonium	Noxious Weed Mgmt.	10 acres
	Glyphosate	Vegetation Mgmt. Recreation improvement	437 acres
	Imazapyr	Recreation improvement	.5 acres
	Metsulfuron methyl	Noxious Weed Mgmt.	232 acres
	Oxyflurofen	Noxious Weed Mgmt.	21 acres
	Picloram	Right of Way Mgmt. Vegetation Mgmt. Wildlife improvement	3,585 acres

DISEASE	HOST	LOCATION	REMARKS
OTHER			
Pinon/Juniper dieback	Pinon pine, Rocky Mountain juniper	Colorado	A dieback of unknown cause (possibly due to drought and shallow soils) was observed in the Dry Park and Horsefly Canyon areas of the Uncompahgre Plateau, Norwood Ranger District, Uncompahgre NF.
Porcupine feeding	Engelmann spruce, Limber pine, Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Widespread damage due to porcupine feeding was observed in all coniferous species at Buttermilk Ski Area, Aspen RD, White River NF.
Sprout dieback	Aspen	Colorado	Examples of regeneration failure and dieback may be found on the Grand Mesa, Uncompahgre, Gunnison, San Juan, and Routt NF's. However, no significant failures were reported in 1995.
Squirrel damage	Hackberry, Honeylocust, Maples, Ponderosa pine, Russian olive, Siberian elm	Colorado, South Dakota	No significant activity was reported for 1995.
Subalpine fir decline	Subalpine fir	Wyoming	In 1995, areas of subalpine fir mortality were detected on the northern edge of the main Medicine Bow Range on private lands which totaled 160 acres. Additionally, small patches of subalpine fir mortality were detected on Casper Mountain, in particular, and on the western side of the state, in general.

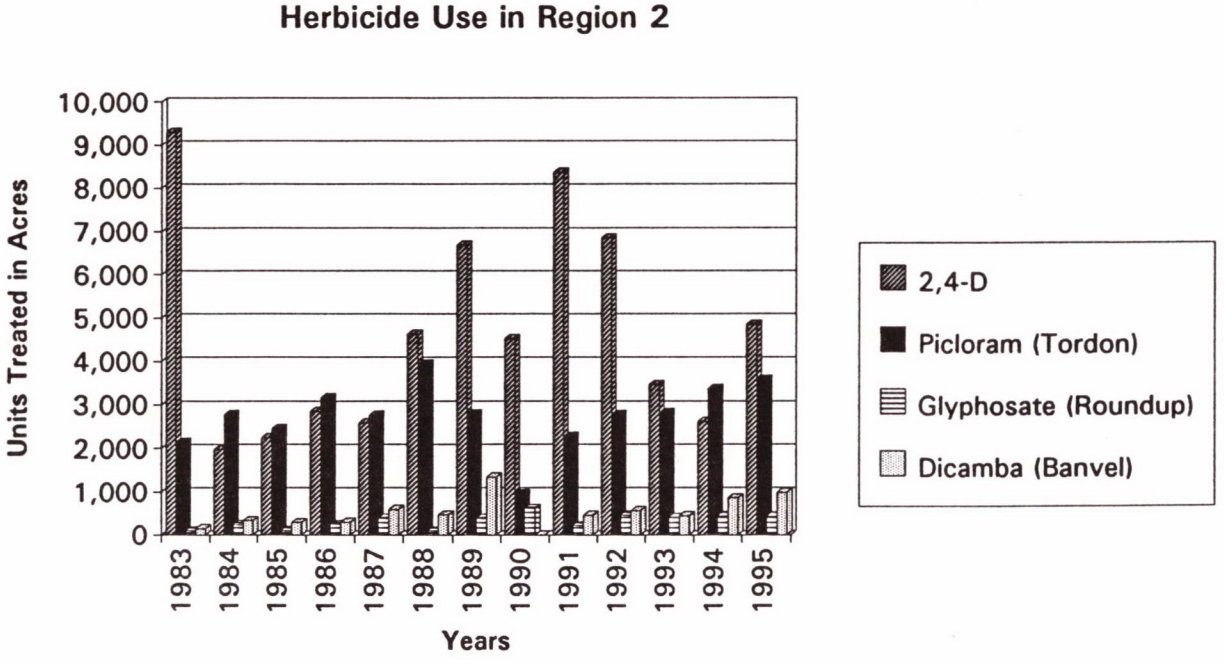
PESTICIDE USE IN REGION 2 IN FISCAL YEAR 1995

Type of Pesticide	*Chemical Used* [1/]	*Primary Mgmt. Activity*	*Units Treated in Acres*
Herbicide	Sulfometuron methyl	Vegetation Mgmt.	88 acres
	Triclopyr	Noxious Weed Mgmt. Site Preparation	117 acres
Insecticide	Coumaphos	Insect Mgmt./cattle	3,800 head of cattle
	Dimethoate	Insect Mgmt.	33.5 acres
Rodenticide	Zinc phosphide	Prairie dog control Animal damage control	2,600 acres
Biological control	Defoliating beetles	Noxious Weed Mgmt.	1,600 beetles
	Stem beetles	Noxious Weed Mgmt.	800 beetles
	Flea beetles	Noxious Weed Mgmt.	500 beetles

1/ Includes use by the USDA Forest Service, other federal agencies, permittees, licensees, and grantees.

HERBICIDE USE IN REGION 2

While our knowledge of biological control is developing, the use of herbicides continues as an essential part of Forest Health Management. Herbicides are valuable tools in management of noxious weeds and undesirable vegetation in range management and in forest tree nursery management. The following graph shows herbicide use trends for 1983 - 1995. The major target species in the graph are the sagebrushes, thistles, leafy spurge, and various broadleaf weeds for range improvement and roadside management projects.



USDA FOREST SERVICE FEDERAL CERTIFIED APPLICATOR REFS. FSM 2150 AND FSH 2109.1 1 REPORT FS-2100-L			ADM. UNIT NFS LANDS R 2	
			FY - 95	10/31/95
CATEGORY	1 TOTAL NUMBER CERTIFIED LAST REPORT	2 NUMBER CERTIFIED THIS FY	3 REVOKED/ SUSPENDED CERTIFICATION THIS FY	4 TOTAL CERTIFIED END OF THIS FY
(4) AGRICULTURAL	60	37	2	53
(5) FOREST	16	8	2	14
(6) ORNAMENTAL AND TURF	1	1	0	2
(7) RANGELAND TREATMENT	1	1	0	2
(8) AQUATIC	2	0	1	1
(9) RIGHT - OF - WAY	42	28	1	41
(10) INDUSTRIAL	5	0	0	5
(11) RESEARCH	1	0	1	0
(12) NUMBER OF CERTIFIED EMPLOYEES	61	37	2	59

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